

# Altair

Subject: 9th Biology

Topic: Water,  
the Molecule of Life

Date: June 24th

2011



Teacher's notes

Objectives

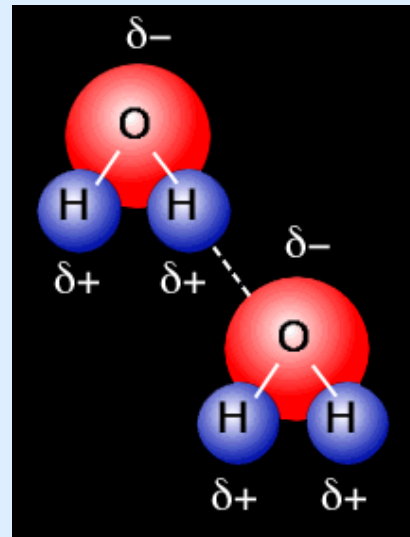
Vocabulary

Link and Learn

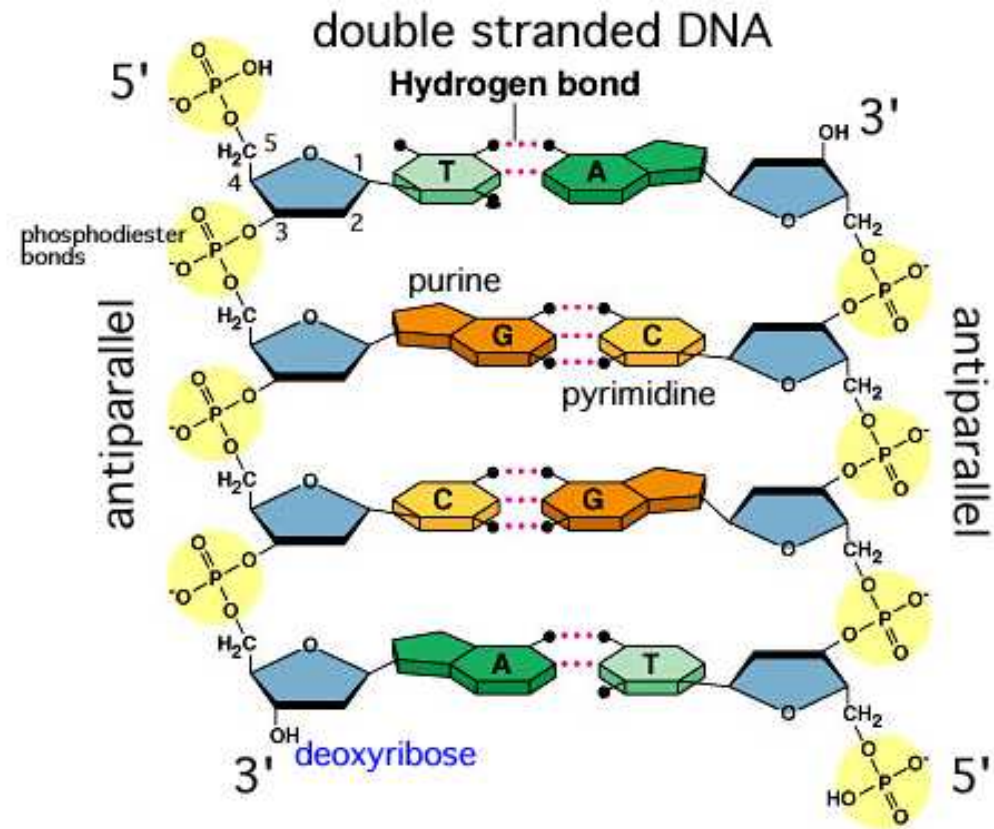
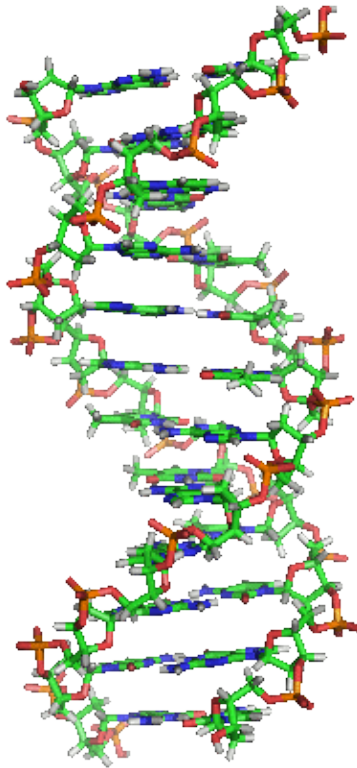
Prepared by

# Hydrogen Bonding

- Certain substances such as  $\text{H}_2\text{O}$ ,  $\text{HF}$ ,  $\text{NH}_3$  form hydrogen bonds, and the formation of which affects properties (melting point, boiling point, solubility) of the substance.
- Other compounds containing  $\text{OH}$  and  $\text{NH}_2$  groups also form hydrogen bonds.
- Molecules of many organic compounds such as alcohols, acids, amines, and aminoacids contain these groups, and thus hydrogen bonding plays an important role in biological science.



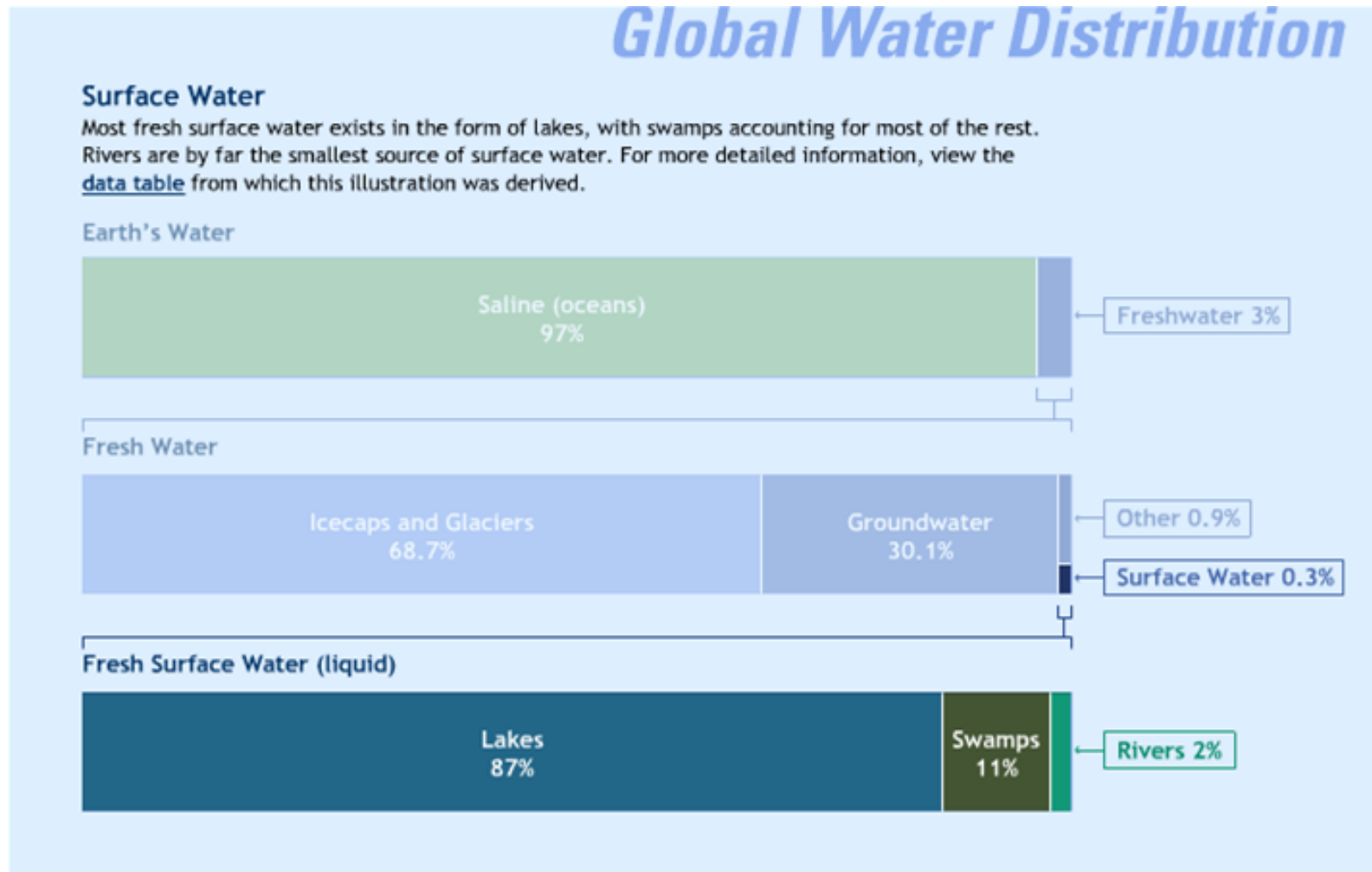
# Hydrogen Bonds in DNA





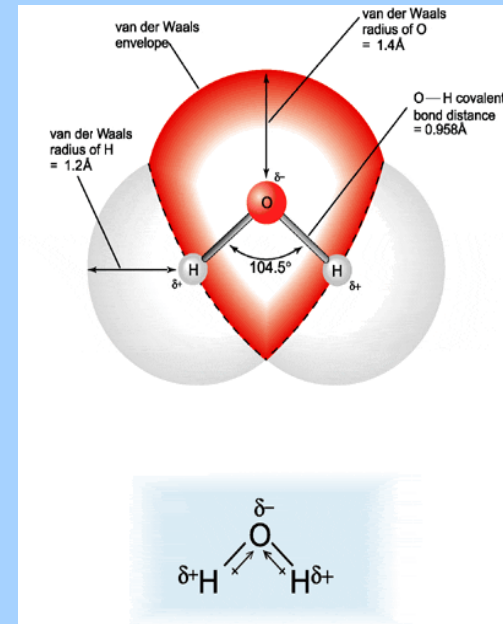
The Water Cycle  
<http://goo.gl/h7BRb>

# Water in the World



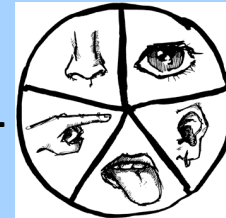
# Characteristics of Water

- Certain molecules have an uneven distribution of positive and negative charges on its atoms. For example: WATER.



## CHARACTERISTICS

### PHYSICAL



The 5 most common are: temperature, taste, colour, odour and turbidity.

### CHEMICAL



The most important chemical characteristics of water are its *acidity*, *alkalinity*, *hardness*, and *corrosiveness*.

# Characteristics of Water

- The most common and unusual liquid is Water.
- A rare characteristic of water, is the fact that it is liquid at room temperature, for a molecule of such low molar mass.
- The freezing and boiling points of water are much higher than one might expect from a comparison of these properties to those of similar substances.

Table 3. Melting and Boiling Points of Group IV and Group VI Hydrides [3, 4]

Formula	Molar mass (g/mol)	Freezing point (°C)	Boiling point (°C)
H <sub>2</sub> Te	130	-49	-2
H <sub>2</sub> Se	81	-60	-40
H <sub>2</sub> S	34	-85	-61
H <sub>2</sub> O	18	0	100
SnH <sub>4</sub>	123	-150	-52
GeH <sub>4</sub>	77	-165	-88
SiH <sub>4</sub>	32	-185	-112
CH <sub>4</sub>	16	-182	-164

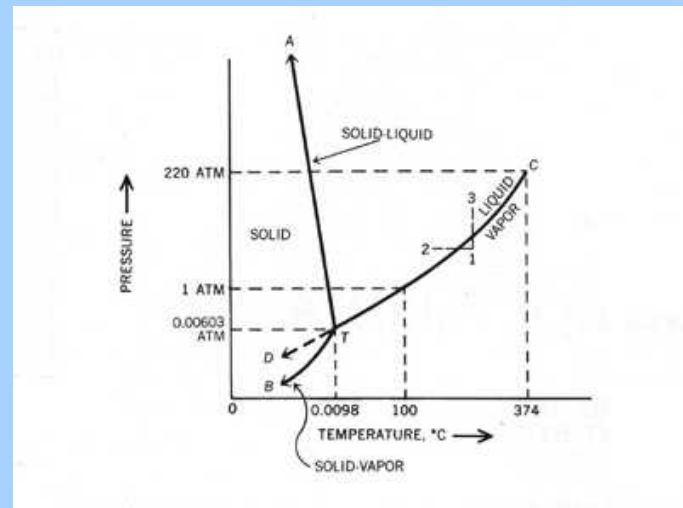
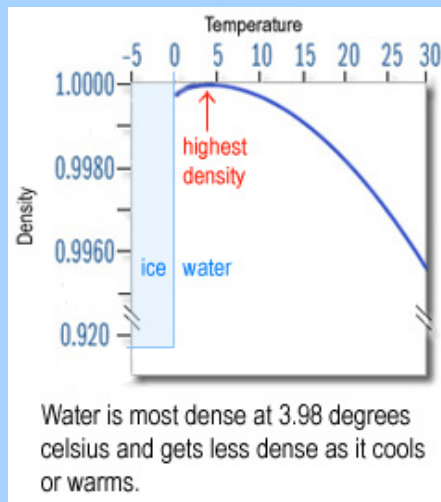
What freezing and boiling points would you expect for the molecule of water from the information in the table?

Freezing Point

Boiling Point

# Properties of Water

- Most properties of water are anomalous.
- As in other liquids, the density of water increases when the temperature is lowered. But in the water molecule, only down to 4°C.
- Below this temperature, the liquid density decreases.
- The density of ice (solid water) is higher than that of liquid water. Water is one of very few liquids, whose solid form floats.
- This property has significant consequences for bodies of water: lakes, lagoons, etc. The temperature at the bottom is never lower than 4°C, unless the body of water freezes completely from surface to bottom.







A closer look at Water  
<http://goo.gl/eHFOS>



Bonds in biological molecules  
<http://goo.gl/HKEoL>

# Properties of Water

## **ADHESION COHESION**

- Water molecules are attracted to other molecules of water. This is called *Cohesion*.
- Water can also be attracted to other materials. This is called *Adhesion*.
- This is explained by the uneven distribution of charge in the molecule of water, generating electrostatic attraction and repulsion.
- Those interactions give water its cohesive and adhesive properties.

## **SURFACE TENSION**

Is the cohesion of water molecules at the surface of a body of water.

## **CAPILLARY ACTION**

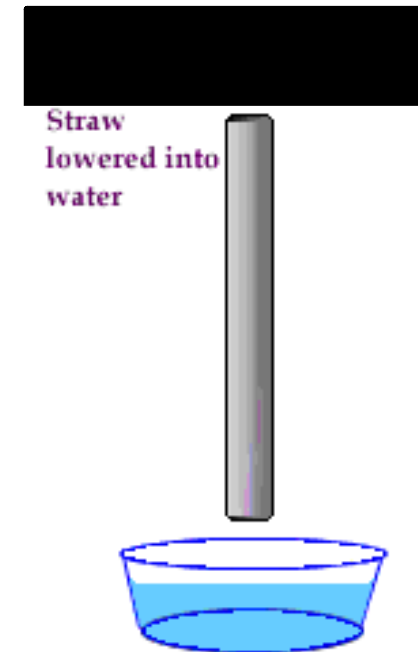
- Surface tension is related to the cohesive properties of water.
  - Capillary action however, is related to the adhesive properties of water.
- Example: Place a straw into a glass of water. The water 'climbs' up the straw. What is happening is that the water molecules are attracted to the straw molecules.
- Capillary action is limited by gravity and the size of the straw. The thinner the straw or tube the higher up capillary action will pull the water.



**ADHESION  
COHESION**

**SURFACE  
TENSION**

**CAPILLARY  
ACTION**





Jesus Christ Lizard  
<http://goo.gl/bE02>



# **Properties of Water**

[\*\*http://goo.gl/iWZu3\*\*](http://goo.gl/iWZu3)

# Water Quiz



**Click Here**

<http://ga.water.usgs.gov/edu/sc3.html>

# Teacher's Notes

**This class has been designed to cover the topics of *Water* from Monday, June 20th till Friday, June 4th.**

**For further knowledge about this topic:**

- 1. Conduct a thorough search under the topic: *Water* on the Web, books and magazines.**
- 2. If findings are not specific, ask your teacher for suggestions.**

# **BACK**



# Objectives

## ***General***

- **Identify and describe the properties, functions and importance of the molecule of Water.**
- **Identify the uses and applications of water in industry, medicine, and society in general.**

***Note:*** All, or most, of the objectives will be covered during class time, however the student must be responsible for those objectives not covered or concluded.

# **BACK**

# Vocabulary

- Melting Point
- Boiling Point
- Density
- Surface Tension
- Tension-Cohesion
- Dipole

**Note:** *Most of the vocabulary words will be covered during class time, however the student must be responsible for those words not covered or concluded.*

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# Link and Learn

**You can visit the following websites to improve your understanding on the present topic:**

- <http://water.usgs.gov/>
- <http://science-altair.wikispaces.com>
- <http://learningandscience.blogspot.com>

# **BACK**

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